

2008 North Carolina A&T State University Research Annual Report of Accomplishments and Results

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I. Report Overview

1. Executive Summary

OVERVIEW

The School of Agriculture and Environmental Sciences (SAES) continues to focus on its six strategic program initiatives: (1) Human and Community Development, (2) Biotechnology and Biodiversity, (3) Soil and Water Quality, (4) Agromedicine, Nutrition and Food Safety, (5) Small Scale Agriculture, and (6) International Trade and Development.

Overall, 2008 was a productive year with highlights and accomplishments in the following areas:

Program Growth

Once again, the Agricultural Research Program in the School of Agriculture and Environmental Sciences (SAES) at North Carolina A&T State University (NCA&TSU) exceeded the previous year's extramural funding and achieved the highest amount ever received by the program. The program outside funding grew by 13 percent over the previous year. This occurred, in part, due to our success with meeting or exceeding funding goals for the six program initiatives. It also occurred as a result of the school's success in receiving three USDA Capacity Building Program grants and a full complement of the School's allotted initial Evans-Allen state grant funding.

SAES became a full university partner with the National Center for Food Protection and Defense of the U. S. Homeland Security and secured funding that is expected to lead to future additional agency funding.

The School of Agriculture and Environmental Sciences entered its third year as a partner in the new North Carolina Research Campus (NCRC) at Kannapolis, North Carolina. The NCRC is funded by the North Carolina General Administration for the 16 state-funded universities. This year, our laboratories became fully operational and one lead scientist and an administrative assistant were employed full-time. Two research scientists are serving as interim co-directors until the program is fully operational. The opportunity to participate in this new research consortium has grown largely out of our very active and successful research and demonstrated capacities involving the Agromedicine, Nutrition and Food Safety Initiative. Our primary research focus is on post harvest technologies, with specific emphasis on fruits and vegetables. A faculty summit was held this past program year to develop strategies that would enable all SAES departments to be involved in the NCRC consortium initiative. Administrators and faculty identified areas of biomass utilization from by-products obtained from production of fruits and vegetables and economic analyses of potential commercial uses of those products as leading areas for faculty research.

The program continues to grow despite changes in administration. The SAES Dean moved into the interim position of Provost and Vice Chancellor for Academic Affairs and an interim Dean is leading the School. In addition, the Associate Dean for Research retired from the university and was replaced by an interim Associate Dean.

Two expected accomplishments this year did not occur. The evaluation specialist position was not filled and planning concerning combining our NCA&T Plan of Work with that of North Carolina State University has not moved forward.

Breakthroughs and Developments

SAES research continues efforts in addressing food safety issues related to peanuts. Clinical studies being conducted by the University of North Carolina at Chapel Hill School of Public Health continue the alleviation of peanut allergens.

Results of a food safety study suggest that natural ingredients may be used to control the growth of Salmonella in peanut butter. This finding has great potential because it shows that control of an illness causing pathogen may be possible without the use of any chemicals, process technology or changing the quality characteristics of the finished product. It is not related to any previous work done in this area. The researchers plan to continue this study and possibly to file a patent on their work.

Coordination with Cooperative Extension

A major goal of SAES is integration of the Cooperative Extension and the Agricultural Research Programs to have the maximum impact on issues facing North Carolina. This continues to pose challenges, but NCA&T is making progress. Combining the NCA&T State University's CSREES Plan of Work with that of North Carolina State University is one way this might be achieved. However, critical to this development is the independence and lack of critical mass of the research scientists and Cooperative Extension Specialists to pursue research and agricultural support services consistent with the mission of SAES and NCA&T. Implementation of one productive strategy this past year was to coordinate combined efforts of Research and Cooperative Extension on several Evans-Allen projects, especially in the Human and Community Development arena. These efforts grew out a major meeting held the previous year to help researchers increase their understanding of how issues that families, groups and communities face might be incorporated into research proposals involving research and outreach. Successful examples of collaboration between Extension and research include the development and training of crop and livestock production technology, Small Farms Week, and field days. A major challenge to the continuation of this effort is to fill vacant positions in Extension with positions that complement the work of our research faculty.

Regional Projects

Research scientists are involved in five regional projects: (1) Economic Impacts of International Trade and Domestic Policies on Southern Agriculture (SCD331); (2) Economic Assessment of Changes in Trade Arrangements, Bioterrorism Threats and Renewable Fuel Requirements on the US Grain and Oilseed Sector, (3) Genetic and Functional Genomic Approaches to Improve Production and Quality of Pork (NC1037), and (4) Managing and Marketing Environmental Plants for Improved Production, Profitability, and Efficiency, and (5) Local Food Choices, Eating Patterns, and Population Health (NC1033).

HIGHLIGHTS FROM PLANNED PROGRAMS

Human and Community Development

Work continues on creating coordination among the Community Based Organizations in the Southeast US to address issues facing the region. A major conference was held this year focusing on data sharing and collaboration. Participant evaluations indicate that the workshop was successful.

A study seeking to understand the underlying factors affecting health care in the Black Belt was completed. The data collected from the surveys were geocoded to identify the spatial characteristics of the Black Belt Region. The analysis by regional location yielded mixed results. The resulting maps show some relation between survey results and their spatial location, but the scale at which the data were collected did not allow the causes to be specifically determined. Nevertheless, the analysis provided a good indicator of some overall trends, and has provided a preliminary step to more local analyses, producing a better idea of the localized factors that could affect the variance among data points.

One scientist provided data useful to understanding the impact of location on the access and affordability of food. Study results were presented to local and statewide planners and policy makers who were invited to attend a two-day conference about the local food environment in Greensboro. The conference, "A Call to Action: Working Together to Solve North Carolina's Obesity Crisis" October 7-8, 2008 was supported by the Greensboro NC Moses Cone Wesley Long Community Foundation. Those who attended were provided information regarding food access in relation to availability and affordability of food in general, and fruits and vegetables in particular, in Greensboro. Data presented at the conference showed that the availability of fruits and vegetables is lower in low income areas of the city than in higher income areas. However, fresh fruits and vegetables availabilities in low income areas were better or equal to higher income areas.

Biotechnology and Biodiversity

Animal waste remains a major problem in NC that negatively impacts quality of life for many rural citizens and profitability of the livestock industry. Researchers are investigating a hydrothermal liquefaction process that is anticipated to have positive impact on both of these problems by converting waste into usable biofuels.

Researchers gained new knowledge about the immune response in goats and cows at the molecular level, which is expected to lead to new management strategies for producers. The study focused on natural resistance to parasitic infection in goats. The effect on gene expression of Nystatin, a lipid raft inhibitor and anti-fungal agent, was evaluated. Twelve DNA sequences have been identified and deposited in GENBANK. Identification of genes and systems relevant to understanding of host parasite systems could lead to control strategies that might reduce U.S. livestock loss of upwards of \$8 billion annually from infectious bacteria and parasites.

A major economic impact on North Carolina swine producers are the pathogenic outbreaks and contaminations caused by the disease Scours. Efforts are underway to study the mechanisms of virulence and to develop vaccines for possible prevention and treatment. This is particularly important in that North Carolina ranks second nationally in swine production. The Gastroenteric Disease Center at Penn State University is a major collaborator. The current focus is studying antigenic components of pathogenic E. coli isolates of porcine origin from North Carolina and assessing their feasibility as vaccines for the prevention of these diseases.

Soil and Water Quality

Researchers are continuing work using the NC A&T State farm to develop and evaluate ways to improve the soil and water quality in the state. Specifically, the focus is on sustainable tillage practices as well as on providing alternative ways for small farmers to treat hog wastes.

Agromedicine, Nutrition and Food Safety

Peanut skins are a by-product of the peanut processing industry with little or no economic value, but are rich in polyphenols, including procyanidins, catechins, phenolic acids and resveratrol. The results of two studies suggest alternative value-added utilizations of peanut skins as a dietary supplement and food preservative. These studies indicate that (1) long term ingestion of peanut skin seems to correlate with improved serum profile in test rats and that (2) PSE exhibited significant antibacterial effect in raw ground beef.

A study aimed to develop biocontrol and hurdle technology to enhance microbial safety fresh produce was conducted looking at lytic bacteriophages as natural enemies of bacteria and logical candidates for the control of foodborne pathogens. The study investigated the effect of bacteriophage treatment on the survival of E. coli O157:H7 in liquid media and on green leafy lettuce. The results suggest that the EHEC-specific phage cocktail used in this study has the potential to control E. coli O157:H7 contamination in fresh produce, thereby, benefiting the fresh produce industry, as well as increasing the microbial food safety of the American food supply.

Small Scale Agriculture

A study focusing on the determinants of small farm success in North Carolina was completed. Due to the declining numbers of small farm production in the state, it is critical to determine what might be done to reverse this trend. A review of the literature

suggested that viable predictors of success for small farm operators included: education in the use of computers (including programming and financial management), effective marketing strategies, enterprise diversification and income. A questionnaire was developed for conducting the case studies and three case studies were conducted. The results revealed that farmers rarely utilized computers and instead keep kept manual records. The findings also suggest that income also may not be as important as believed. The overall "love of farming" seemed to be the driving force behind the farmer's view of success, and not profit.

There is an alternative nutrient source for enhancing profitability and environmental stewardship. The target audiences of this study were limited resource and sustainable livestock producers across NC and other Southeastern US regions. This project provided insights into less expensive alternative feeds/forage for livestock. Pearl Millet is a forage crop that is more tolerant to drought and at the same time has comparable nutritional value when compared to the traditional corn forage crop. Severe drought has and continues to be a dominant crop production constraint across the Southeastern USA especially for livestock producers. With mounting evidence for climate change and increased climate variability, the risk of drought will likely also increase and the pattern of drought sensitive areas may become more irregular. Providing information on alternative feed source for livestock will help mitigate economic risk, associated with reduced crop yield or total crop failure due to moderate or severe drought.

International Trade and Development

Although there have not been major breakthroughs in marketing NC food and agricultural products abroad, there has been substantial study of the marketing opportunities for NC producers and sharing of this information with producers and potential entrepreneurs. This continued focus and effort is expected to yield future benefits for North Carolina producers.

Total Actual Amount of professional FTEs/SYs for this State

Year:2008	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.0	13.5
Actual	0.0	0.0	0.0	15.4

II. Merit Review Process

1. The Merit Review Process that was Employed for this year

- Combined External and Internal University External Non-University Panel

2. Brief Explanation

The research director has the primary responsibility for determining the need, priority, and scientific feasibility of the projects proposed and has a procedure for project documentation, merit review, and selection. The procedure assures that the research proposals are scientifically sound, relevant to society's food and agricultural needs, and not duplicative of efforts undertaken elsewhere. Prior to proposal development, alignment of the topic with the needs of the state and the direction of the six program initiatives in the School of Agriculture and Environmental Sciences is determined. Upon agreement by the department chair, the associate dean for research, the research director, and the principal investigator prepare a proposal on the topic for submission through the Evans-Allen program. The Merit Review Process includes a review by five peer reviewers composed of persons from both within and outside the university who are knowledgeable in or familiar with the area of research. The principal investigator is responsible for incorporating suggestions made by the reviewers and must give reasons for any substantive suggestions not included or addressed. The proposal is then reviewed by the associate dean for research who determines if additional review and substantive revision is necessary. Upon acceptance by the associate dean for research and the research director, the proposal is submitted for budgetary review by the Office of Agricultural Research and then transmitted to CSREES/USDA for approval.

III. Stakeholder Input

1. Actions taken to seek stakeholder input that encouraged their participation

- Targeted invitation to traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to selected individuals from general public

Brief Explanation

There are on-going activities that encourage stakeholder participation. In addition to the formal meetings involving Agricultural Research Program administrators and stakeholders, the program conducts several outreach activities as a means for gathering input from those impacted by the school's research activities or who use the research results. One major event is the Small Farms Week, an activity jointly sponsored by the Cooperative Extension Program and the Agricultural Research Program. During this week, farmers, commodity group representatives, and consumers attended activities held both on and off campus involving Extension and research. A second major event is the Grassroots Leadership Conference. Administrators and researchers in the Agricultural Research Program participate in three conferences held in the three Extension programming regions of the state (eastern, central and mountain) to listen to the issues, concerns, and the needs of farmers, community leaders, residents, volunteers, members of the Strategic Planning Council, specialized committee members and county and staff members. These grassroots conferences also assist the Agricultural Research Program in needs assessment for proposal development and program priorities. Through these activities, SAES shares information about research underway at the University, and receives input from those that use the research results. Other major outreach activities include field days that bring farmers, commodity groups, and consumers into direct contact with specific SAES scientists and research projects. Feedback is also sought about research and research related activities by the scientists, their research teams, and by staff associated with ARP and the University; the input is then shared within SAES and incorporated into future research activities.

A major statewide agenda that continues to affect our research program and all aspects of the School of Agriculture and Environmental Sciences is UNC Tomorrow, an initiative of the General Administration for the 16 public state universities. This initiative is affecting the substance and community involvement with the research program particularly related to concerns of global readiness and economic transformation of communities. Our planned programs support multiple aspects of these concerns.

2(A). A brief statement of the process that was used by the recipient institution to identify individuals and groups stakeholders and to collect input from them

1. Method to identify individuals and groups

- Use Advisory Committees
- Use External Focus Groups
- Open Listening Sessions
- Needs Assessments
- Use Surveys

Brief Explanation

The individual and group stakeholders are identified by their membership in organizations that are agriculturally-related in the state. This includes all farmers and grower groups, cooperatives and community organizations. The Dean, other administrators and many faculty members serve on various boards across the state that either serve the stakeholders or have stakeholders on the boards.

Diverse methods are used to collect information and data on stakeholder needs. There is a proactive effort including face-to-face meetings with groups as well as reading/reviewing current documents (strategic plans, newspapers, newsletters, etc.) that identify research needs of individuals and communities in North Carolina.

2(B). A brief statement of the process that was used by the recipient institution to identify individuals and groups who are stakeholders and to collect input from them

1. Methods for collecting Stakeholder Input

- Meeting with traditional Stakeholder groups
- Survey of traditional Stakeholder groups
- Survey of traditional Stakeholder individuals
- Meeting with the general public (open meeting advertised to all)
- Meeting specifically with non-traditional groups

Brief Explanation

The methods for collecting the information primarily is through meetings but also includes surveys completed by the faculty as well as published reports and white papers.

3. A statement of how the input was considered

- To Identify Emerging Issues
- Redirect Research Programs
- In the Staff Hiring Process
- To Set Priorities

Brief Explanation

Administrators and faculty use the input about stakeholder needs in determining the direction and nature of research projects as well as in hiring scientists needed in the identified subject matter areas.

Brief Explanation of what you learned from your Stakeholders

Major input from the stakeholders confirm their continuing concern about the following issues:(1) the bioeconomy, (2) health, wellness and nutrition, (3) special enterprises, and (4) 4-H and youth development, and (5) water quality and quantity.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	0	3392214

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	0	0	0	2828470
Actual Matching	0	0	0	2241668
Actual All Other	0	0	0	290340
Total Actual Expended	0	0	0	5360478

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous years				
Carryover	0	0	0	293152

V. Planned Program Table of Content

S. NO.	PROGRAM NAME
1	Human and Community Development
2	Biotechnology and Biodiversity
3	Soil and Water Quality
4	Agromedicine, Nutrition and Food Safety
5	Small Scale Agriculture
6	International Trade and Development

Program #1

V(A). Planned Program (Summary)

1. Name of the Planned Program

Human and Community Development

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
601	Economics of Agricultural Production and Farm Management				20%
802	Human Development and Family Well-Being				15%
803	Sociological and Technological Change Affecting Individuals, Families and Communities				15%
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures				20%
805	Community Institutions, Health, and Social Services				30%
	Total				100%

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2008	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.0	3.5
Actual	0.0	0.0	0.0	1.8

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	0	344283
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	187402
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	16383

V(D). Planned Program (Activity)

1. Brief description of the Activity

Conduct research studies in the following areas; (1) to determine the challenges of new manufactured home owners in the site installation of the units and to develop recommendations to the industry for improving the installation process, (2) to develop a database of community-based organizations (CBOs) by location, program priorities, capacity and method of operation to encourage collaboration among CBOs, policymakers, businesses and development agencies, and (3) to define factors that impact leadership development in rural areas that could lead to new or improved programs for developing future leaders and contributing to the sustainability of rural communities.

- Present findings at professional meetings. •Publish research findings in professional journals.
- Share findings with Extension educators and with other groups that may use the information in improving collaboration and/or methods of information delivery.

2. Brief description of the target audience

- Individuals and families living in rural areas •Underserved populations •Rural communities •Policy makers
- Community based organizations •Scientific Community

V(E). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons (contacts) reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	466	235000	40	0
2008	641	485833	47	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year	Target
Plan:	0
2008 :	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan	0	5	
2008	0	11	0

V(F). State Defined Outputs

Output Target

Output #1**Output Measure**

- # Entries in database of community-based organizations

Year	Target	Actual
2008	59	0

Output #2**Output Measure**

- # presentations at professional meetings

Year	Target	Actual
2008	5	25

Output #3**Output Measure**

- # media occurrences

Year	Target	Actual
2008	10	5

Output #4**Output Measure**

- # published articles in research and other professional journals

Year	Target	Actual
2008	5	11

V(G). State Defined Outcomes**V. State Defined Outcomes Table of Content**

O No.	OUTCOME NAME
1	# organizations accessing and using database of community-based organizations
2	Revision of Community Voices curricula by Extension specialists and others to include data from research study
3	# policy makers using data to reduce installation and other challenges faced by manufactured home owners.

Outcome #1

1. Outcome Measures

organizations accessing and using database of community-based organizations
Not reporting on this Outcome for this Annual Report

Outcome #2

1. Outcome Measures

Revision of Community Voices curricula by Extension specialists and others to include data from research study
Not reporting on this Outcome for this Annual Report

Outcome #3

1. Outcome Measures

policy makers using data to reduce installation and other challenges faced by manufactured home owners.
Not reporting on this Outcome for this Annual Report

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Public Policy changes
- Government Regulations

Brief Explanation

The outcomes listed in the Human and Community Development Planned Program focus on long term attainment. The identified measures are very specific to studies in increasing the effectiveness of community based organizations, in developing rural community leadership and in improving the quality of manufactured housing. These initiatives take time to achieve.

There are also other research studies that are having impact in this planned program. However, outcomes and measures of these outcomes need development. The new leadership in the research program will need to address these needs.

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- During (during program)

Evaluation Results

Key Items of Evaluation

Program #2

V(A). Planned Program (Summary)

1. Name of the Planned Program

Biotechnology and Biodiversity

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
133	Pollution Prevention and Mitigation				20%
201	Plant Genome, Genetics, and Genetic Mechanisms				10%
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants				10%
302	Nutrient Utilization in Animals				10%
308	Improved Animal Products (Before Harvest)				20%
311	Animal Diseases				10%
403	Waste Disposal, Recycling, and Reuse				20%
Total					100%

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2008	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.0	2.0
Actual	0.0	0.0	0.0	3.4

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	0	807005
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	651040
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	105460

V(D). Planned Program (Activity)

1. Brief description of the Activity

Conduct research studies to expand understanding of the mechanism of scours and characterize strains that cause the disease, to improve understanding of the biology of edible and medicinal exotic mushrooms to be able to identify appropriate commercial strains, to develop technologies to convert corn stalks and cheese whey into biofuels and biomaterials including hydrogen, bioethanol and succinic acid, to seek non-antibiotic additives in poultry production to control poultry diseases of *Campylobacter jejuni* and *Salmonella*, and to decipher gene expression associated with combating bacterial infection (mastitis) in cattle.

- Give presentations at professional meetings and with Cooperative Extension
- Publish findings in professional journals and in the Agricultural Research Program research magazine
- Seek patents for new discoveries.

Conduct tours, workshops and other activities to share findings with Extension educators and with companies that may commercialize products.

2. Brief description of the target audience

- Companies involved in biotechnology applications
- Farmers involved in producing agricultural products using biotechnology and those who are considering it
- Consumers

V(E). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons (contacts) reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	848	235000	160	0
2008	1850	485833	4309	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year	Target
Plan:	0
2008 :	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan	0	5	
2008	0	31	0

V(F). State Defined Outputs**Output Target****Output #1****Output Measure**

- # articles published in research and other professional journals

Year	Target	Actual
2008	5	31

Output #2**Output Measure**

- # presentations at professional meetings

Year	Target	Actual
2008	7	33

Output #3**Output Measure**

- # media occurrences

Year	Target	Actual
2008	2	2

V(G). State Defined Outcomes**V. State Defined Outcomes Table of Content**

O No.	OUTCOME NAME
1	# of licenses of current patents
2	# of filings for intellectual property

Outcome #1

1. Outcome Measures

of licenses of current patents

Not reporting on this Outcome for this Annual Report

Outcome #2

1. Outcome Measures

of filings for intellectual property

Not reporting on this Outcome for this Annual Report

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Public Policy changes
- Government Regulations

Brief Explanation

New ideas for patents and intellectual property are underway but there are not reporting new items at this time.

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- During (during program)

Evaluation Results

Key Items of Evaluation

Program #3

V(A). Planned Program (Summary)

1. Name of the Planned Program

Soil and Water Quality

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships				34%
112	Watershed Protection and Management				22%
133	Pollution Prevention and Mitigation				8%
205	Plant Management Systems				28%
403	Waste Disposal, Recycling, and Reuse				8%
	Total				100%

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2008	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.0	2.0
Actual	0.0	0.0	0.0	2.3

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	0	379184
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	472825
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	6940

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Conduct research studies to develop low-cost water filtration systems using nutshell-based activated carbons, to determine and measure the effectiveness of cover crops in meeting the nutrient needs in organic cropping systems, to use constructed wetlands for treatment of swine wastewater, and to assess how soil management practices, especially no-till approaches, affect soil quality over time.
- Present findings at professional meetings.
- Publish research findings in professional journals.
- Share findings with Extension educators and with other groups that may use the information to improve the viability of small scale agricultural operations.

2. Brief description of the target audience

- Extension educators
- Small-scale and limited resource farmers
- Environmental groups interesting in preserving soil and water quality

V(E). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons (contacts) reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	398	235000	0	0
2008	1797	485833	4049	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year	Target
Plan:	0
2008 :	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan	0	5	
2008	0	5	0

V(F). State Defined Outputs**Output Target****Output #1****Output Measure**

- # field days

Year	Target	Actual
2008	1	3

Output #2**Output Measure**

- # presentations at professional meetings

Year	Target	Actual
2008	4	6

Output #3**Output Measure**

- # articles published in research and other professional journals

Year	Target	Actual
2008	5	5

Output #4**Output Measure**

- # workshops on improved soil and water management practices

Year	Target	Actual
2008	3	3

Output #5**Output Measure**

- # media occurrences

Year	Target	Actual
2008	5	2

V(G). State Defined Outcomes**V. State Defined Outcomes Table of Content**

O No.	OUTCOME NAME
1	% farmers adopting improved soil and water quality management practices
2	Development of water treatment (wetlands) for small-scale farmers

Outcome #1**1. Outcome Measures**

% farmers adopting improved soil and water quality management practices

2. Associated Institution Types

•1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	50	14

3c. Qualitative Outcome or Impact Statement**Issue (Who cares and Why)**

Intensive tillage and limited reintroduction of low organic matter are two major factors contributing to soil degradation in the southeastern United States. Small scale vegetable growers need information on pre-determined combinations of practices they can adopt that will rapidly and effectively improve soil quality and crop productivity.

What has been done

Research has been completed that has contributed to the knowledge base in using no tillage, cover crops and compost to improve soil quality. A workshop was held to share this information with small scale producers.

Results

Fourteen producers attended the workshop. All participants reported that the information presented was most useful and helpful in their on-farm operation.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships

Outcome #2**1. Outcome Measures**

Development of water treatment (wetlands) for small-scale farmers

Not reporting on this Outcome for this Annual Report

V(H). Planned Program (External Factors)**External factors which affected outcomes**

- Natural Disasters (drought, weather extremes, etc.)
- Government Regulations

Brief Explanation**V(I). Planned Program (Evaluation Studies and Data Collection)****1. Evaluation Studies Planned**

- During (during program)

Evaluation Results**Key Items of Evaluation**

Program #4

V(A). Planned Program (Summary)

1. Name of the Planned Program

Agromedicine, Nutrition and Food Safety

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
204	Plant Product Quality and Utility (Preharvest)				10%
502	New and Improved Food Products				30%
503	Quality Maintenance in Storing and Marketing Food Products				10%
701	Nutrient Composition of Food				18%
703	Nutrition Education and Behavior				12%
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins				20%
	Total				100%

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2008	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.0	5.5
Actual	0.0	0.0	0.0	2.3

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	0	629568
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	483254
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	49058

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Conduct studies to determine functional food ingredients from selected North Carolina agricultural by-products, to evaluate select plant extracts as potential food preservatives and anticarcinogens, to enhance the microbiological quality of probiotic supplements, to determine food knowledge and practices among different population subgroups and develop targeted and focused intervention methods for maximum effect, and to improve healthy eating and physical activity of Hispanic women.
- Present findings at professional meetings and with Cooperative Extension
- Publish research findings in professional journals and Agricultural Research Program's research magazine.
- Seek patents for new discoveries.
- Conduct tours, workshops and other activities to share findings with Extension educators and with companies that may commercialize products.

2. Brief description of the target audience

The target audience for this research are the following:

- Extension educators for use in programs and outreach activities
- Companies involved in health and nutrition related products and/or food safety
- Consumers

V(E). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons (contacts) reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	890	235000	63	0
2008	1720	485833	4049	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year	Target
Plan:	1
2008 :	0

Patents listed

3. Publications (Standard General Output Measure)**Number of Peer Reviewed Publications**

	Extension	Research	Total
Plan	0	5	
2008	0	29	0

V(F). State Defined Outputs**Output Target****Output #1****Output Measure**

- # new patents in food and food-related discoveries

Year	Target	Actual
2008	1	0

Output #2**Output Measure**

- # presentations at professional meetings

Year	Target	Actual
2008	5	41

Output #3**Output Measure**

- # articles published in research and other professional journals

Year	Target	Actual
2008	5	29

Output #4**Output Measure**

- # media occurrences

Year	Target	Actual
2008	6	4

V(G). State Defined Outcomes**V. State Defined Outcomes Table of Content**

O No.	OUTCOME NAME
1	# hispanic women adopting healthy nutrition and exercise practices
2	# of companies purchasing licenses for food and food safety related patents
3	# of adolescents reducing their overweight and obesity status

Outcome #1**1. Outcome Measures**

hispanic women adopting healthy nutrition and exercise practices

Not reporting on this Outcome for this Annual Report

Outcome #2**1. Outcome Measures**

of companies purchasing licenses for food and food safety related patents

Not reporting on this Outcome for this Annual Report

Outcome #3**1. Outcome Measures**

of adolescents reducing their overweight and obesity status

2. Associated Institution Types

•1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	50	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior

V(H). Planned Program (External Factors)**External factors which affected outcomes**

- Populations changes (immigration,new cultural groupings,etc.)
- Other (National public health problem)

Brief Explanation

These outcomes are long-term in nature. Current studies are focused on these outcomes.Broader outcomes and measures need to be developed for this planned program.

V(I). Planned Program (Evaluation Studies and Data Collection)**1. Evaluation Studies Planned**

- During (during program)

Evaluation Results

Key Items of Evaluation

Program #5**V(A). Planned Program (Summary)****1. Name of the Planned Program**

Small Scale Agriculture

V(B). Program Knowledge Area(s)**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
202	Plant Genetic Resources				13%
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants				17%
205	Plant Management Systems				17%
206	Basic Plant Biology				8%
308	Improved Animal Products (Before Harvest)				13%
401	Structures, Facilities, and General Purpose Farm Supplies				32%
	Total				100%

V(C). Planned Program (Inputs)**1. Actual amount of professional FTE/SYs expended this Program**

Year: 2008	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.0	2.4
Actual	0.0	0.0	0.0	5.2

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	0	584199
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	401310
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	10692

V(D). Planned Program (Activity)**1. Brief description of the Activity**

- Conduct studies in the following areas: (1) to promote rural business growth by defining opportunities for rural entrepreneurs and connecting these entrepreneurs with small-scale agricultural enterprises, existing rural businesses and prospective entrepreneurs, (2) to determine viable alternatives to tobacco for small scale producers including floriculture production in tobacco greenhouses, outdoor and indoor mushroom production, and specialty melons and other crops, (3) to seek improved methods for washing green leafy vegetables for use especially by small scale farmers, and (4) to identify factors influencing successful small farm operations in North Carolina that can be developed into a protocol for evaluating the predicted success of small farm operations.

- Present findings at professional meetings.

- Publish research findings in professional journals.

- Share findings with Extension educators and with other groups that may use the information to improve the viability of small scale agricultural operations.

2. Brief description of the target audience

The targeted audiences include the scientific community, the general public, small-scale farmers and operations, rural community businesses, traditionally underserved populations and communities.

V(E). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons (contacts) reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	858	235000	0	0
2008	2763	485833	4085	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year	Target
Plan:	0
2008 :	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan	0	5	
2008	0	12	0

V(F). State Defined Outputs

Output Target

Output #1**Output Measure**

- # presentations at professional meetings

Year	Target	Actual
2008	7	28

Output #2**Output Measure**

- # articles published in research and other professional journals

Year	Target	Actual
2008	5	12

Output #3**Output Measure**

- # media occurrences

Year	Target	Actual
2008	7	5

V(G). State Defined Outcomes**V. State Defined Outcomes Table of Content**

O No.	OUTCOME NAME
1	# mushroom growers
2	# lbs and sales in mushroom production
3	% farmers in groups indicating increase in knowledge about small scale operations

Outcome #1**1. Outcome Measures**

mushroom growers

2. Associated Institution Types

•1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	200	450

3c. Qualitative Outcome or Impact Statement**Issue (Who cares and Why)**

The mushroom production program is providing a viable alternative to tobacco for small farmers in North Carolina.

What has been done

The mushroom initiative continues to offer assistance to small producers by offering demonstration workshops, by conducting research on how to best match the strains with the environmental requirements in the varying state regions, and also by providing expertise on producer problems and disease control and marketing issues.

Results

The number of producers continues to grow. The number has grown from 384 to 450 producers since last year, a growth of about 18 percent.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
202	Plant Genetic Resources

Outcome #2**1. Outcome Measures**

lbs and sales in mushroom production

2. Associated Institution Types

•1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	2500	3862

3c. Qualitative Outcome or Impact Statement**Issue (Who cares and Why)**

The mushroom initiative continues to develop and one measure of growth is the number of pounds of mushrooms produced. This initiative provides an alternative income producing opportunities for small scale producers.

What has been done

The small producers continue to produce mushrooms, based on the scientific advice received from the university.

Results

The pounds produced is greater than anticipated or projected.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
401	Structures, Facilities, and General Purpose Farm Supplies

Outcome #3

1. Outcome Measures

% farmers in groups indicating increase in knowledge about small scale operations

2. Associated Institution Types

•1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	50	100

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

With the decline in tobacco production in the state, many small scale farmers are forced to either cease farming or shift production to viable alternatives.

What has been done

Scientists have researched and developed alternative production opportunities for small scale farmers particularly in the areas of pasture pork, mushrooms, and organic vegetables. This information has been shared in many forms and very effectively through field days on the university farm.

Results

The Small Farms Conference is held annually at NCA&T and part of the conference is a field day on the university farm. Almost 100 persons participated in the field day and 23 responded to an evaluation survey. All respondents indicated that the information presented was helpful and relevant, especially the sessions on GPS, swine, beef, equine and the planting of peppers. All indicated that they would likely attend farm field days in the future.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
401	Structures, Facilities, and General Purpose Farm Supplies

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Public Policy changes
- Government Regulations

Brief Explanation

V(l). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- During (during program)

Evaluation Results

Key Items of Evaluation

Program #6

V(A). Planned Program (Summary)

1. Name of the Planned Program

International Trade and Development

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
601	Economics of Agricultural Production and Farm Management				10%
602	Business Management, Finance, and Taxation				10%
603	Market Economics				15%
604	Marketing and Distribution Practices				15%
605	Natural Resource and Environmental Economics				10%
610	Domestic Policy Analysis				20%
611	Foreign Policy and Programs				20%
Total					100%

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2008	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.0	1.3
Actual	0.0	0.0	0.0	0.4

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	0	84231
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	45837
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	101807

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Conduct research studies concerning the economic assessment of changes in trade agreements, bioterrorism threats and economic fuel requirements on various industry sectors, and seeking new domestic and international markets for North Carolina producers with particular emphasis on small scale operations.
- Present findings at professional meetings.
- Publish research findings in professional journals.
- Share findings with Extension educators and with other groups that assist small scale producers find markets for their products.

2. Brief description of the target audience

The target audience includes the producers in small scale agriculture and small businesses in North Carolina.

V(E). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons (contacts) reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	148	235000	0	0
2008	100	485833	36	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year	Target
Plan:	0
2008 :	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan	0	3	
2008	0	1	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- # articles published in research and other professional journals

Year	Target	Actual
2008	3	1

Output #2

Output Measure

- # presentations at professional meetings

Year	Target	Actual
2008	5	2

Output #3

Output Measure

- # media occurrences

Year	Target	Actual
2008	6	1

Output #4

Output Measure

- # of research projects focusing on developing regional and international markets for NC products

Year	Target	Actual
2008	3	2

V(G). State Defined Outcomes**V. State Defined Outcomes Table of Content**

O No.	OUTCOME NAME
1	# of different NC products exported
2	# of small farmers and businesses trained and becoming involved in export of their products
3	% of increased income by farmers and businesses served by the International Trade Center
4	% of stakeholders who use the information and policy research in their decision making
5	# of new regional or national markets found for NC products
6	# of small farmers and businesses trained in finding regional and national markets for their products

Outcome #1**1. Outcome Measures**

of different NC products exported

*Not reporting on this Outcome for this Annual Report***Outcome #2****1. Outcome Measures**

of small farmers and businesses trained and becoming involved in export of their products

2. Associated Institution Types

•1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	3	27

3c. Qualitative Outcome or Impact Statement**Issue (Who cares and Why)**

Small farmers and businesses need to know how to market their products for international export. This knowledge can assist them in increasing the sales and booster their existence in today's economy.

What has been done

Agricultural economists have completed studies on international markets for NC products and have offered their services through the NCA&T's International Trade and Development Center.

Results

The scientists have assisted businesses and individuals in learning more about the international markets. About 250 individuals and over 27 businesses have benefited from the conferences, courses, and individual meetings.

4. Associated Knowledge Areas

KA Code	Knowledge Area
611	Foreign Policy and Programs
610	Domestic Policy Analysis

Outcome #3**1. Outcome Measures**

of increased income by farmers and businesses served by the International Trade Center

*Not reporting on this Outcome for this Annual Report***Outcome #4****1. Outcome Measures**

of stakeholders who use the information and policy research in their decision making

*Not reporting on this Outcome for this Annual Report***Outcome #5**

1. Outcome Measures

of new regional or national markets found for NC products

2. Associated Institution Types

•1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	10	20

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Connecting farmers with potential buyers of their products is the lifeline of financial success for small farmers.

What has been done

Scientists in agricultural economics involved with the International Trade and Development Center meet with farmers to train them and connect them with viable markets.

Results

The Center identified a broker/retailer and a restaurant operator who is willing to buy free range pork directly from farmers at a premium price. As a result 20 small pork farmers are negotiating a contract with this potential buyer to supply 15 pigs per farmer per week.

4. Associated Knowledge Areas

KA Code	Knowledge Area
610	Domestic Policy Analysis
604	Marketing and Distribution Practices

Outcome #6

1. Outcome Measures

of small farmers and businesses trained in finding regional and national markets for their products

2. Associated Institution Types

•1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2008	20	27

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Small farmers and businesses need to know how to market their products in local, regional and national markets. This knowledge can assist them in increasing sales and boost their success in today's economy.

What has been done

Agricultural economists have completed studies on local, regional and national markets for NC products and have offered this information through activities of NCA&T's International Trade and Development Center.

Results

The scientists have assisted businesses and individuals in learning more about domestic markets. About 250 individuals and over 27 businesses have benefited from the conferences, courses, and individual meetings.

4. Associated Knowledge Areas

KA Code	Knowledge Area
610	Domestic Policy Analysis

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Public Policy changes
- Government Regulations
- Other (Negotiations at the WTO)

Brief Explanation

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Before-After (before and after program)
- During (during program)
- Case Study

Evaluation Results

Key Items of Evaluation